```
import time
start = time.time()
```

```
import os
import cv2
import seaborn as sns
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
from keras.models import Sequential
from keras.layers import Flatten, MaxPooling2D, Conv2D, Dense
from sklearn.metrics import f1_score, confusion_matrix, ConfusionMatrixDisplay
from sklearn.pipeline import Pipeline, make_pipeline
from keras.callbacks import EarlyStopping, ModelCheckpoint, ReduceLROnPlateau
```

```
import random
foo = ['test', 'train']
f = random.choice(foo)
foo1 = ['Dark', 'Light', 'Medium', 'Green']
f1 = random.choice(foo1)
```

```
from random import *
e = randrange(100)
print(f'class : {f} name : {f1} num : {e}')
n = f + '/' + f1 + '/' + f1.lower() + ' ' + '(' +str(e) + ')' + '.png'
print(n)
r = r'/content/drive/MyDrive/archive (1)/' + n
print(r)
```

```
     class : test name : Dark num : 43
     test/Dark/dark (43).png
     /content/drive/MyDrive/archive (1)/test/Dark/dark (43).png
```

```
img = cv2.imread(r)
img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
plt.imshow(img)
```

```
<matplotlib.image.AxesImage at 0x7fb811aa0ad0>
```

```
categories = ['Dark','Green','Light','Medium']
IMG_Size = 100
```

```
training_data = []
test_data = []
def create_data(my_data_path,my_data):
    for ct in categories:
      path = os.path.join(my_data_path,ct)
      class_num = categories.index(ct)
      for img in os.listdir(path):
        datagen = tf.keras.preprocessing.image.ImageDataGenerator(rescale=1./225)
        generator = datagen.flow_from_directory(my_data_path,shuffle=True)
        try:
          img_array = cv2.imread(os.path.join(path,img))
          # img_array = img_array / 255
          img_array = cv2.cvtColor(img_array,cv2.COLOR_BGR2RGB)
          new_array = cv2.resize(img_array, (IMG_Size,IMG_Size))
          my_data.append([new_array,class_num])
        except Exception as e:
          pass


train_data_path = '/content/drive/MyDrive/archive (1)/test'
test_data_path = '/content/drive/MyDrive/archive (1)/train'
create_data(train_data_path,training_data)
create_data(test_data_path,test_data)


x = []
y = []

for features, label in training_data:
  x.append(features)
  y.append(label)

x_test = []
y_test = []

for features, label in test_data:
  x_test.append(features)
  y_test.append(label)


y = np.array(y)
y_test = np.array(y_test)

x = np.array(x).reshape(-1, IMG_Size, IMG_Size, 3)
x_test = np.array(x_test).reshape(-1, IMG_Size, IMG_Size, 3)


early_stopping_monitor = EarlyStopping(monitor='val_accuracy', patience=5, restore_best_we

reduce_lr_on_plateau = tf.keras.callbacks.ReduceLROnPlateau(
    monitor='val_accuracy',
    patience=3,
)

best_model = ModelCheckpoint('/content/drive/MyDrive/bestmodel.hdf5', monitor='accuracy', 
best_val_acc = ModelCheckpoint('/content/drive/MyDrive/best_val_acc.hdf5', monitor='val_ac



model = Sequential()

model.add(Conv2D(32, (3,3), input_shape=(IMG_Size, IMG_Size, 3) , activation='relu'))
model.add(MaxPooling2D(2,2))
model.add(Conv2D(64, (3,3), activation='relu'))
model.add(MaxPooling2D(2,2))
model.add(Conv2D(64, (3,3), activation='relu'))
model.add(Flatten())
model.add(Dense(64, activation='relu'))
model.add(tf.keras.layers.Dropout(.2))
model.add(Dense(4, activation='softmax'))

opt = tf.keras.optimizers.Adam(learning_rate=0.001, decay=1e-6)

# Compile model
model.compile(
    loss='sparse_categorical_crossentropy', # binary_crossentropy, sparse_categorical_cros
    optimizer=opt,
    run_eagerly=True,
    metrics=['accuracy']
)

hist = model.fit(x, y, validation_split=.1, verbose=2, epochs=50, shuffle=True, batch_size
    early_stopping_monitor,
    reduce_lr_on_plateau,
    best_model, best_val_acc])
```

```
Epoch 1/50
6/6 - 8s - loss: 68.7694 - accuracy: 0.2830 - val_loss: 11.0875 - val_accuracy: 0.00
Epoch 2/50
6/6 - 7s - loss: 1.8550 - accuracy: 0.4588 - val_loss: 2.0916 - val_accuracy: 0.0244
Epoch 3/50
6/6 - 7s - loss: 0.8261 - accuracy: 0.6841 - val_loss: 1.7440 - val_accuracy: 0.0976
Epoch 4/50
6/6 - 8s - loss: 0.5206 - accuracy: 0.7995 - val_loss: 0.9740 - val_accuracy: 0.4878
Epoch 5/50
6/6 - 8s - loss: 0.3410 - accuracy: 0.8709 - val_loss: 1.1839 - val_accuracy: 0.3902
Epoch 6/50
6/6 - 7s - loss: 0.1678 - accuracy: 0.9396 - val_loss: 1.6603 - val_accuracy: 0.4878
Epoch 7/50
6/6 - 7s - loss: 0.1062 - accuracy: 0.9560 - val_loss: 0.2400 - val_accuracy: 0.9024
Epoch 8/50
6/6 - 7s - loss: 0.0731 - accuracy: 0.9753 - val_loss: 1.7476 - val_accuracy: 0.5122
Epoch 9/50
6/6 - 7s - loss: 0.1180 - accuracy: 0.9478 - val_loss: 1.0087 - val_accuracy: 0.7317
Epoch 10/50
6/6 - 7s - loss: 0.0670 - accuracy: 0.9808 - val_loss: 0.7902 - val_accuracy: 0.7073
Epoch 11/50
```

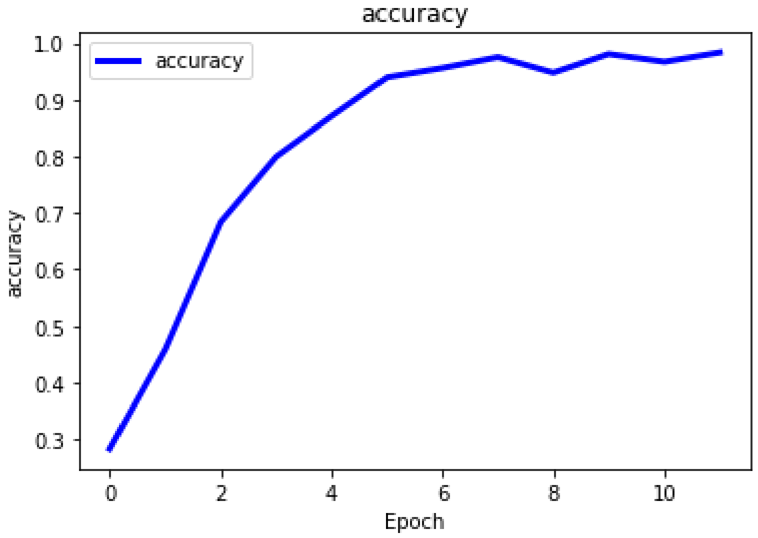
```
6/6 - 7s - loss: 0.0642 - accuracy: 0.9670 - val_loss: 0.7927 - val_accuracy: 0.7561
Epoch 12/50
6/6 - 7s - loss: 0.0355 - accuracy: 0.9835 - val_loss: 0.8970 - val_accuracy: 0.7561
```

```
hist.history??
```

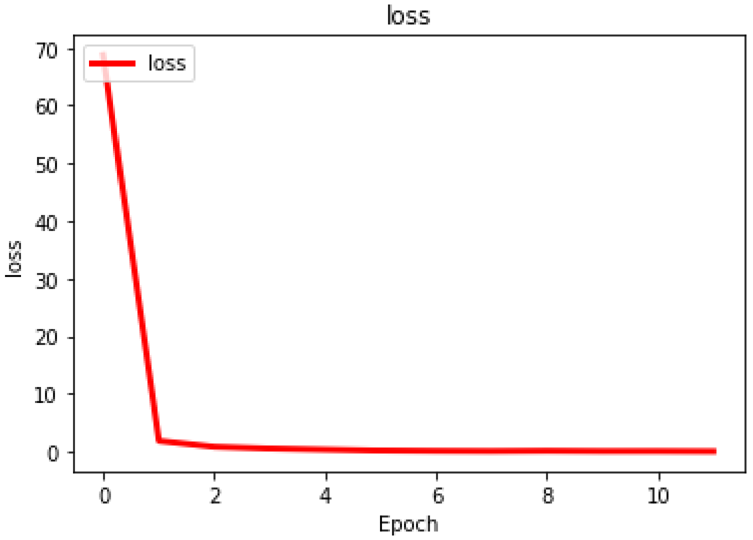
```
def visualization(name,h,color):
  t = h.history[name]
  my_max = max(t)
  my_min = min(t)
  print(f'Name : {name} max : {my_max} min : {my_min}')
  plt.plot(t,color=color,linewidth=3.0)
  plt.title(name)
  plt.ylabel(name)
  plt.xlabel('Epoch')
  plt.legend([name],loc='upper left')
  plt.show()
```

```
visualization('accuracy',hist,'Blue')
visualization('loss',hist,'Red')
visualization('val_accuracy',hist,'Green')
visualization('val_loss',hist,'Black')
```

```
Name : accuracy max : 0.9835164546966553 min : 0.2829670310020447
```



```
Name : loss max : 68.7694091796875 min : 0.035452082753181146
```



```
Name : val_accuracy max : 0.9024389982223511 min : 0.0
```

val_accuracy

```
model.load_weights('/content/drive/MyDrive/bestmodel.hdf5')
res = model.evaluate(x_test, y_test)
print("test loss, test acc:", res)
```

```
38/38 [==============================] - 7s 181ms/step - loss: 0.1309 - accuracy: 0.
test loss, test acc: [0.1308530867099762, 0.9591666460037231]
```

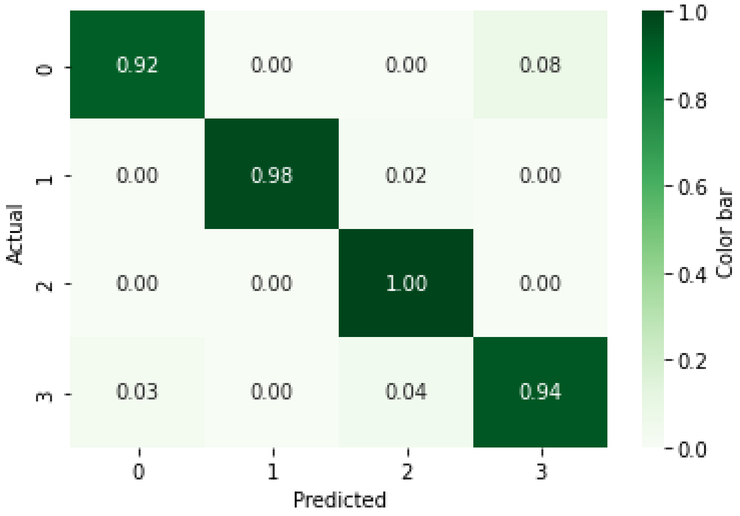
```
def my_predict(my_model,my_x_test):
  y_pred = my_model.predict(my_x_test)
  return y_pred

def my_f1_score(my_y_test,my_y_pred):
  f1 = f1_score(my_y_test, my_y_pred, average="micro")
  return f1

def my_conf_matrix(my_y_test,my_y_pred):
  cm = confusion_matrix(my_y_test, my_y_pred)
  cm_norm = np.round(cm/np.sum(cm,axis=1).reshape(-1,1),2)
  sns.heatmap(cm_norm,cmap='Greens',annot=True,
              cbar_kws={'orientation' : 'vertical','label' : 'Color bar'},
              fmt='.2f'
              )
  plt.xlabel('Predicted')
  plt.ylabel('Actual')
  plt.show()
```

```
y_pred_res = my_predict(model,x_test)
y_pred_res = np.argmax(y_pred_res, axis=-1)
print(my_f1_score(y_test,y_pred_res))
my_conf_matrix(y_test,y_pred_res)
```

```
0.9591666666666666
```

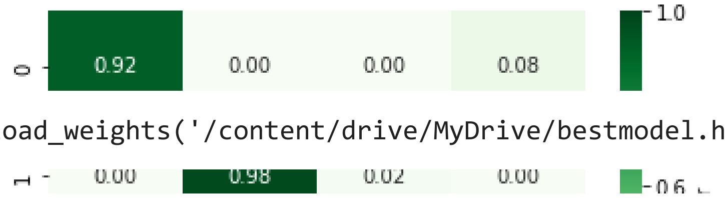


```
model.load_weights('/content/drive/MyDrive/best_val_acc.hdf5')
res = model.evaluate(x_test, y_test)
print("test loss, test acc:", res)
```

```
38/38 [==============================] - 7s 180ms/step - loss: 0.1309 - accuracy: 0.
test loss, test acc: [0.1308530867099762, 0.9591666460037231]
```

```
y_pred_res = my_predict(model,x_test)
y_pred_res = np.argmax(y_pred_res, axis=-1)
print(my_f1_score(y_test,y_pred_res))
my_conf_matrix(y_test,y_pred_res)
```

```
0.9591666666666666
```



```
model.load_weights('/content/drive/MyDrive/bestmodel.hdf5')
```

```
newpath = r'/content/drive/MyDrive/archive/Model'

if not os.path.exists(newpath):
    os.makedirs(newpath)

import pickle

pickle_out = open('/content/drive/MyDrive/archive/Model/model.pickle','wb')
pickle.dump(model,pickle_out)
pickle_out.close()
```

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 98, 98, 32)        896

 max_pooling2d (MaxPooling2D  (None, 49, 49, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 47, 47, 64)        18496

 max_pooling2d_1 (MaxPooling  (None, 23, 23, 64)       0
 2D)

 conv2d_2 (Conv2D)           (None, 21, 21, 64)        36928

 flatten (Flatten)           (None, 28224)             0

 dense (Dense)               (None, 64)                1806400

 dropout (Dropout)           (None, 64)                0

 dense_1 (Dense)             (None, 4)                 260

=================================================================
Total params: 1,862,980
Trainable params: 1,862,980
Non-trainable params: 0
_________________________________________________________________
```

```
end = time.time()
print((end - start)/60)
```

```
5.374265082677206
```

```
pickle_in = open('/content/drive/MyDrive/archive/Model/model.pickle','rb')
model = pickle.load(pickle_in)
```

Colab'in ücretli ürünleri - Sözleşmeleri buradan iptal edebilirsiniz

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